

# ANNUAL REPORT FOR 2002



**Tucker Mitigation Site  
Currituck County  
Project No. 6.049009T  
TIP No. R-2228WM**



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## **SUMMARY**

The following report summarizes the monitoring activities that have occurred in the past year at the Tucker Tract Mitigation Site. This is the fourth year the site has been monitored for vegetation and hydrologic success. The site must demonstrate both hydrologic and vegetation success for a minimum of five years to demonstrate successful mitigation.

The Tucker Tract contains 11 groundwater-monitoring gauges. The site also contains 12 vegetation-monitoring plots. An Infinity tipping bucket rain gauge was installed in August 2000. The daily rainfall data depicted on the monitoring gauge graphs is recorded from an on-site rain gauge. An off-site rain gauge recorded at Elizabeth City, maintained by the NC State Climate Office, contributed to the daily rainfall data and historical rainfall data used for the 30-70 percentile. Hydrologic monitoring indicated that all twelve gauges on site showed saturation for over 12.5% of the growing season.

The fourth year vegetation monitoring of the planted areas revealed an average density to be 394 trees per acre, which is above the minimum requirement of 320 trees per acre.

Based on the hydrologic and vegetation monitoring, the Tucker Mitigation Site met success criteria across the majority of the site during the 2002-growing season. NCDOT recommends that monitoring continue for a fifth year.

## **1.0 INTRODUCTION**

### **1.1 Project Description**

The Tucker Tract Mitigation Site is located in Currituck County (Figure 1). This site is part of a large property consisting of 68.3 acres in total. Approximately 48.1 acres has been set aside for mitigation. Approximately 28.2 acres of the 48.1 acres was developed and constructed as the Tucker Tract Mitigation Site. The remaining 20.2 acres will be reserved for possible future mitigation projects. The site was built to mitigate for the widening of NC 168 (TIP Project R-2228). The project includes the restoration of 25.1 acres of PC agricultural fields on this property to forested wetland and the preservation of 2.8 acres of forested wetland and 8.7 acres of timbered wetland.

The Final Mitigation Plan for this site was issued on April 1, 1996. Initial construction was completed in late 1997. At that time it was determined that the site had been graded to an unacceptable level. A second contract was issued and the site was re-graded in 1998 with completion in September 1998. The site was planted in early 1999. In March 1999, NCDOT installed monitoring gauges to be used for hydrologic monitoring. In 2000, two additional gauges were installed as a result of field review by resource agencies. The two additional gauges were placed to track groundwater in the vicinity of gauge TT-6. Gauge TT-6 is located at an elevation that ranges from 0.7 to 1.0 foot higher than the adjacent topography. The area comprising this locally high area is slightly larger than half an acre. Based on comments at an agency field review in May 2002, Gauge TT-6 was removed from the site. Twelve plots were established to monitor vegetation. This monitoring report presents the fourth year results of both hydrologic and vegetation monitoring.

### **1.2 Purpose**

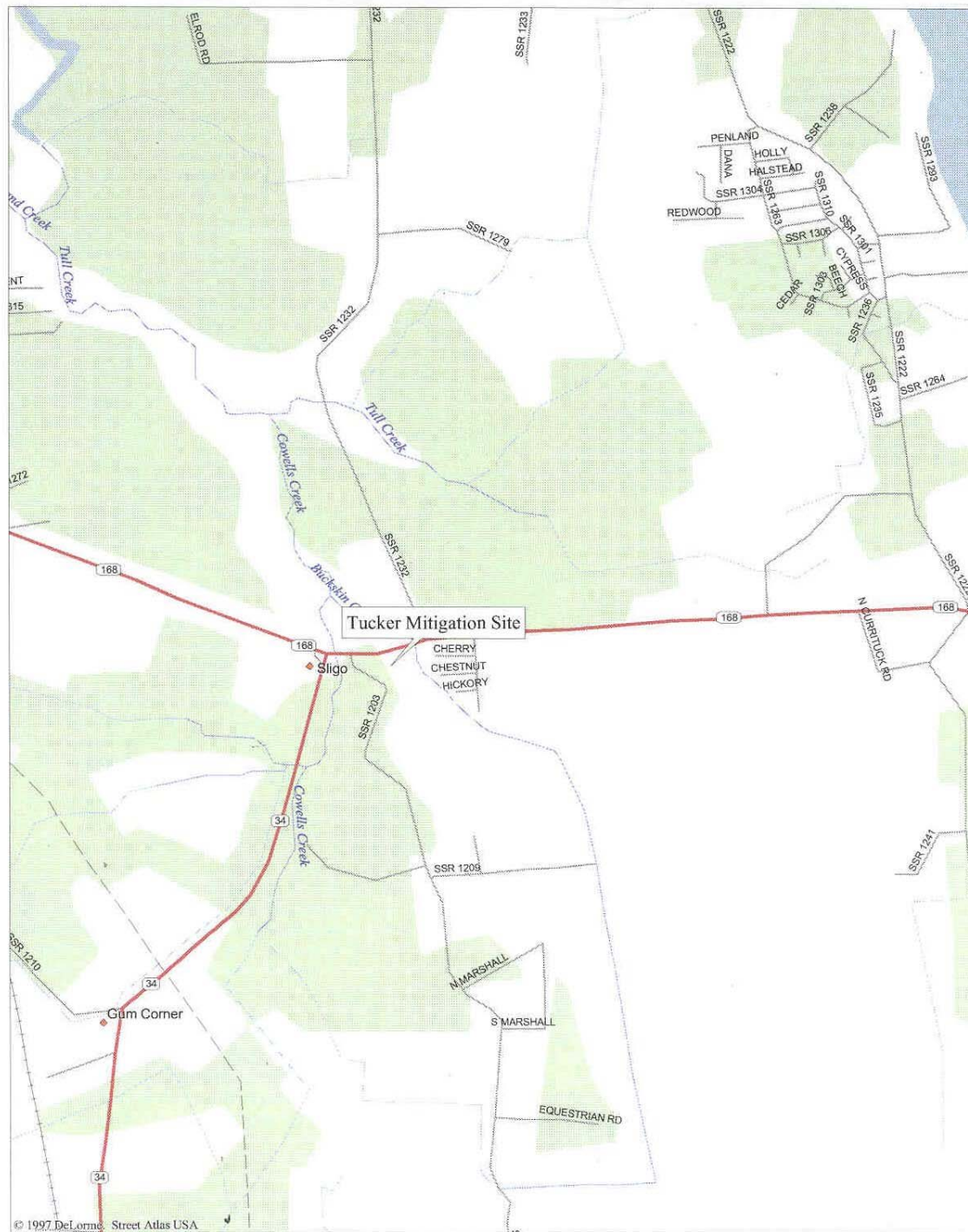
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the year 2002 at the Tucker Tract Mitigation Site, as well as local climate conditions throughout the growing season.

### 1.3 Project History

December 1997	Site Construction completed (contract 1)
September 1998	Site Construction completed (contract 2)
March 1999	Site Planted, Monitoring gauges installed
October 1999	Vegetation Monitoring (1 yr.)
March – November 1999	Hydrologic Monitoring (1 yr.)
August 2000	Vegetation Monitoring (2 yr.)
March – November 2000	Hydrologic Monitoring (2 yr.)
July 2001	Vegetation Monitoring (3 yr.)
March – November 2001	Hydrologic Monitoring (3 yr.)
July 2002	Vegetation Monitoring (4 yr.)
March – November 2002	Hydrologic Monitoring (4 yr.)

### 1.4 Debit Ledger

Tucker Farm	Mit. Plan			Ratios	TIP DEBIT
Currituck County					
Habitat	Acres at Start:	Acres Remaining			R-2228A, BA
SPH Restoration	25.1	0	0.00		25.1
SPH Preservation	2.8	0	0.00		2.8
Upland Mgmt.	8.7	0	0.00		8.7
TOTAL	36.6	0	0.00		



## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

In accordance with Corps guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Currituck County begins March 20 and ends November 13. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 20 and before November 13.<sup>1</sup> The growing season is 239 days; therefore, optimum hydrology requires inundation or saturation 12.5% of this season, or at least 30 consecutive days. Local climate must also represent average conditions for the area.

Based on the Mitigation Plan, hydrologic success is based on soil saturation that is similar to the reference ecosystem and in accordance to Corps guidelines. The reference ecosystem is located on-site in an undisturbed wetland located at a slightly lower elevation in the southern portion of the site, and gauges TT-8 and TT-9 monitor it.

### **2.2 Hydrologic Description**

There are eleven monitoring gauges and one rain gauge installed on-site (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This is the fourth year of hydrologic monitoring for the site.

The principal hydrologic source for this site is precipitation with some input from Buckskin Creek. The Tucker Tract site involved the grading of the field crowns and placing the excess into several drainage ditches to prohibit water from leaving the site. An additional seven to nine inches of fill was brought in to bring the site elevation to its final grade. Several earthen berms were constructed adjacent to the lower areas of the site and adjacent to the residential area. This design will restore wetland hydrology, restrict infiltration losses and surface runoffs, and avoid flooding the adjacent residential area. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

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<sup>1</sup> Natural Resources Conservation Service, Soil Survey of Currituck County, North Carolina, p.71.



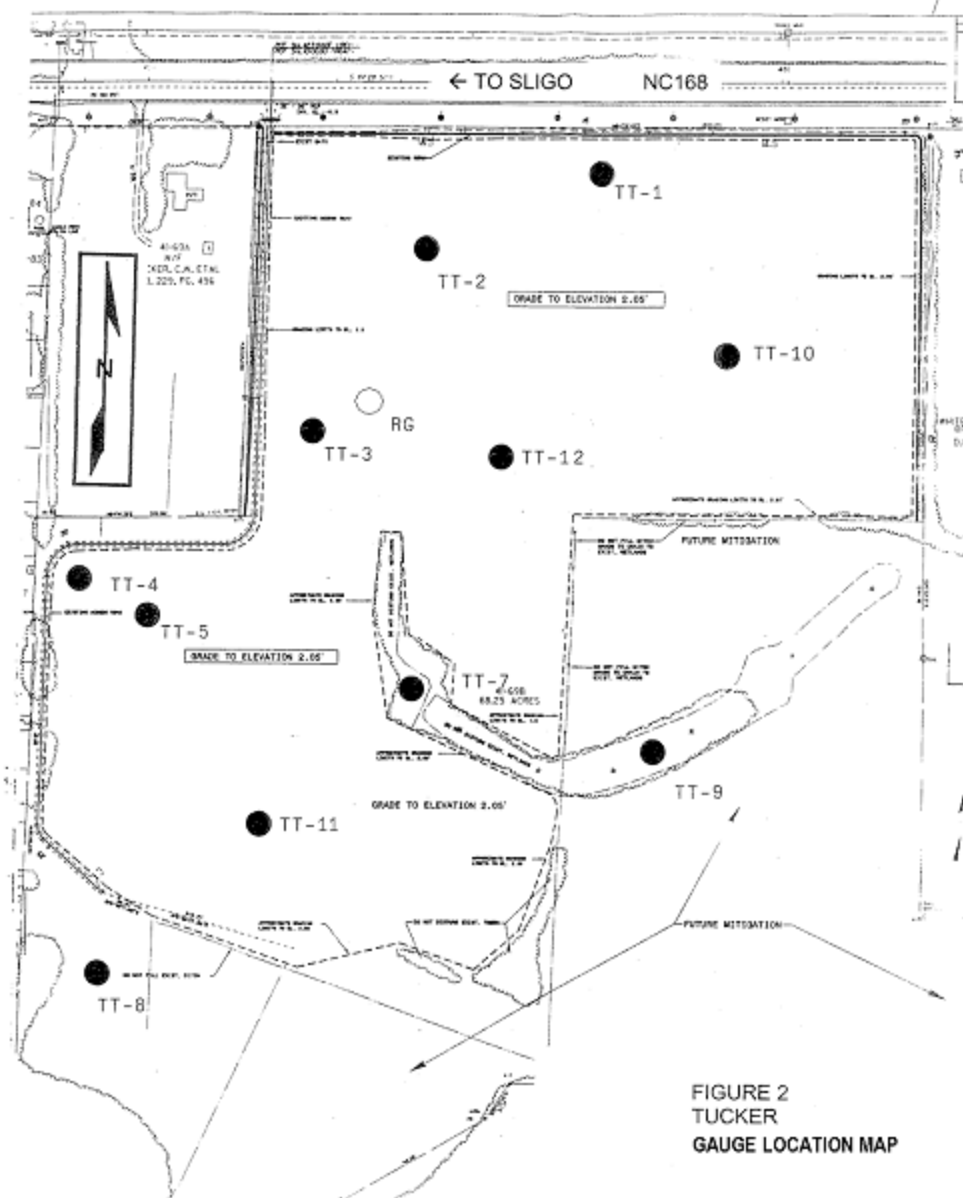


FIGURE 2  
TUCKER  
GAUGE LOCATION MAP

## 2.3 Results of Hydrologic Monitoring

### 2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 239-day growing season. The results are presented in Table 1. Appendix A contains a plot of the groundwater depth for each monitoring gauge and the surface water depth recorded by the surface gauge. The maximum number of consecutive days is noted on each graph. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data collected from the on-site rain gauge.

**Table 1.** 2002 Hydrologic Monitoring Results – Groundwater Gauges

Monitoring Gauge	<5%	5-8%	8-12.5%	>12.5%	Actual %	Dates of Success
TT-1*				✓	26.8	March 20-May 22 Oct 12-Nov 13
TT-2				✓	29.3	March 20-May 28 Sept 5-Nov 13
TT-3				✓	53.1	March 20- May 26 July 10- Nov 13
TT-4				✓	32.2	March 20-June 1 July 11- Aug 11 Aug 29- Nov 13
TT-5				✓	32.2	March 20- May 25 Aug 29- Nov 13
TT-7*				✓	35.6	March 20- June 12 Oct 12-Nov 13
TT-8				✓	31.4	March 20-May 15 Aug 31-Nov 13
TT-9*				✓	13.8	Oct 12- Nov 13
TT-10*				✓	26.0	March 20- May 20 Oct 12- Nov 13
TT-11*				✓	28.0	March 20- May 25 Aug 29-Oct 8 Oct 12- Nov 13
TT-12				✓	33.0	March 20-June 4 July 10- August 8 Aug 28- Nov 13

\* Gauges met the criteria success during an above average rainfall for the month of October.

During the 2002 year all of the monitoring gauges on site indicated a saturation of at least 12.5% for the growing season.

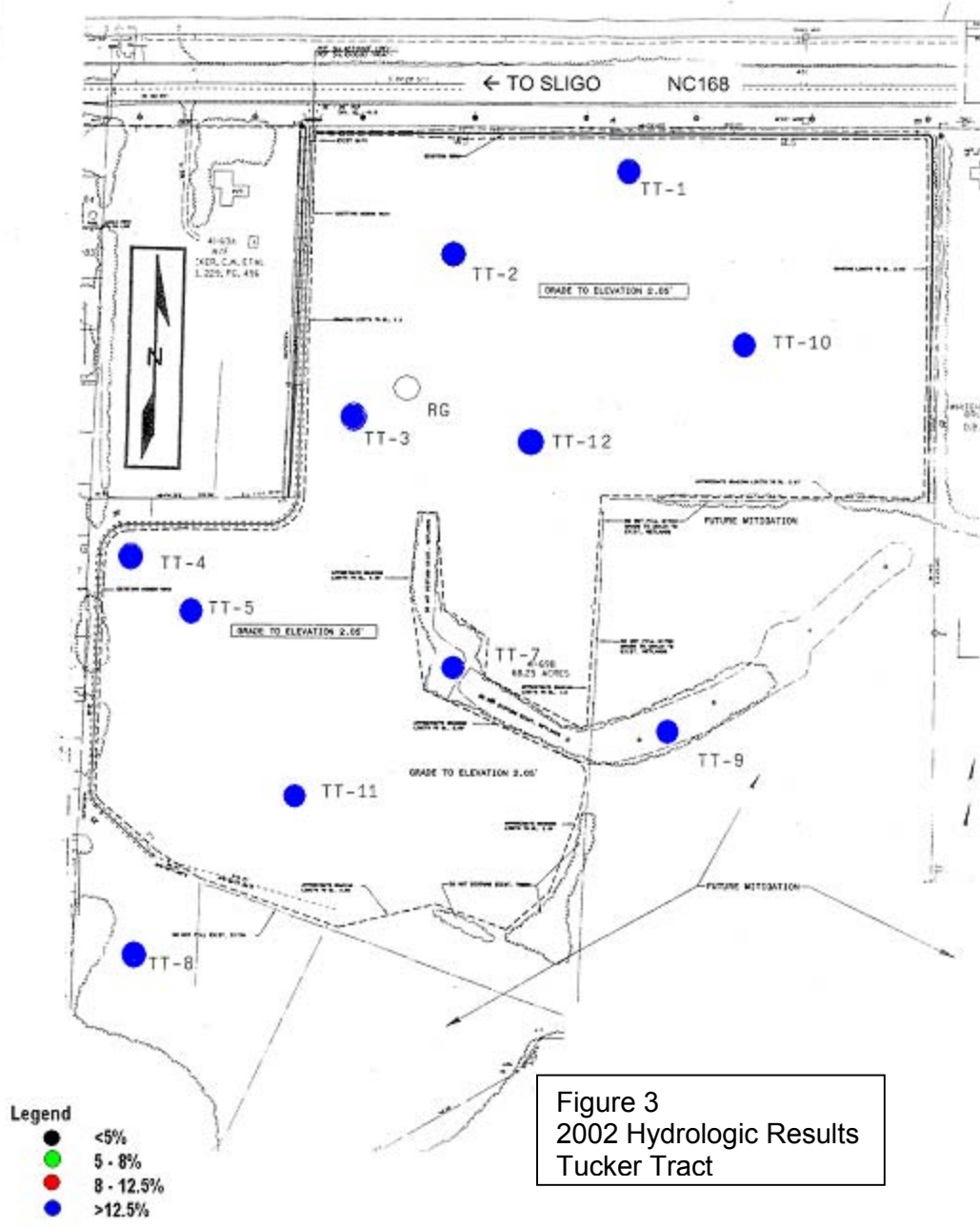
Specific gauge problems encountered during 2002 with the monitoring gauges are listed below. However, these problems did not affect the hydrologic success of the site.

- TT-6 was pulled from the site in May 2002.
- TT-8 stopped recording data on May 16. The gauge was replaced and programmed to begin recording data on June 27.
- TT-9 was found destroyed by a bear on April 5. The gauge was replaced and programmed to begin recording data on June 26.

Figure 3 is a graphical representation of the hydrologic monitoring results. Based on the Mitigation Plan, hydrologic success is soil saturation that is similar to the reference ecosystem and in accordance to Corps guidelines. The reference ecosystem is located on-site in an undisturbed wetland located at a slightly lower elevation in the southern portion of the site, and gauges TT-8 and TT-9 monitor it. In accordance with Corps guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Area inundated for less than 5% of the growing season is always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

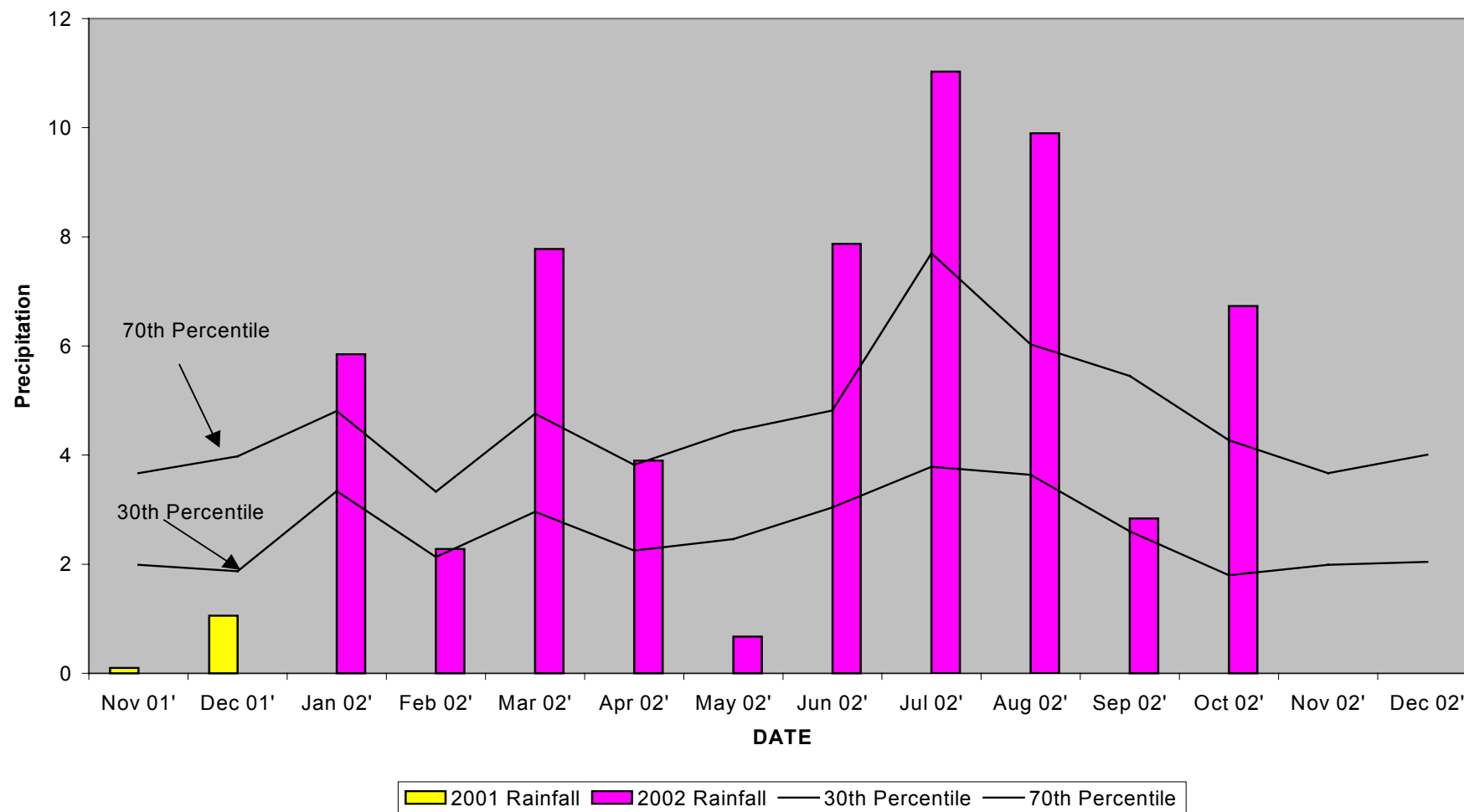
### **2.3.2 Climatic Data**

Figure 4 comparison of monthly rainfall for the period of November 2001 through October 2002 to historical precipitation (collected between 1971 and 2002) for Elizabeth City, North Carolina. This comparison gives an indication of how 2002 relates to historical data in terms of climate conditions. The NC State Climate Office provided all off-site data. February and May experienced below average rainfall. The months of April and September all recorded average rainfall for the site. January, March, June, July, August, and October experienced above average rainfall. No data is available for November or December however; the site meets hydrologic success criteria without these data.



**FIGURE 4**

**Tucker 30-70 Percentile Graph 2002  
Elizabeth City, NC**



## **2.4 Conclusions**

The year 2002 represents the fourth growing season that the hydrologic data has been examined. All monitoring gauges on site have shown saturation for long periods of time during an average to below average rainfall monitoring period. Hydrologic monitoring data in 2002 met or exceeded the success criteria for jurisdictional wetland hydrology for the majority of the site. Gauges will continue to be closely monitored during subsequent field trips.

### 3.0 VEGETATION: TUCKER TRACT MITIGATION SITE (YEAR 4 MONITORING)

#### 3.1 Success Criteria

NCDOT will monitor the site for five years or until success criteria is met. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

#### 3.2 Description of Species

The following tree species were planted in the Wetland Restoration Area:

##### Zone 1: Wetland Reforestation (14.05 Acres)

*Fraxinus pennsylvanica*, Green Ash

*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak

*Quercus michauxii*, Swamp Chestnut Oak

*Quercus phellos*, Willow Oak

*Quercus nigra*, Water Oak

*Quercus lyrata*, Overcup Oak

*Nyssa aquatica*, Water Tupelo

##### Zone 2: Wetland Reforestation (9.04 Acres)

*Taxodium distichum*, Baldcypress

*Fraxinus pennsylvanica*, Green Ash

*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak

*Quercus michauxii*, Swamp Chestnut Oak

*Quercus phellos*, Willow Oak

*Quercus lyrata*, Overcup Oak

##### Zone 3: Wetland Reforestation (1.89 Acres)

*Quercus phellos*, Willow Oak

*Quercus nigra*, Water Oak

*Fraxinus pennsylvanica*, Green Ash

*Taxodium distichum*, Baldcypress

*Quercus lyrata*, Overcup Oak

*Nyssa aquatica*, Water Tupelo

*Quercus michauxii*, Swamp Chestnut Oak

### 3.3 Results of Vegetation Monitoring

ZONE	Plot #	Overcup Oak	Water Tupelo	Green Ash	Baldcypress	Water Oak	Willow Oak	Swp. Chestnut Oak	Cherrybark Oak	Total (4 year)	Total (at planting)	Density (Trees/Acre)
1	4			13		2	8	9	6	38	55	470
	5	1		10			10	10	2	33	48	468
	8			19			4	4		27	52	353
	9			10			14	3	4	31	40	527
	10			8		1	3	1	1	14	39	244
	11			5			1	4		10	48	142
ZONE 1 AVERAGE DENSITY												367
2	6	7			14		6	2	3	32	50	435
	7	7		3	14		2	1		27	62	296
	12	6		8	10		4		2	30	48	425
ZONE 2 AVERAGE DENSITY												385
3	1	10	3	13	11		2			39	53	500
	2	19					2	4		25	51	333
	3	10	14	9	9		2			44	56	534
ZONE 3 AVERAGE DENSITY												456
TOTAL AVERAGE DENSITY												394



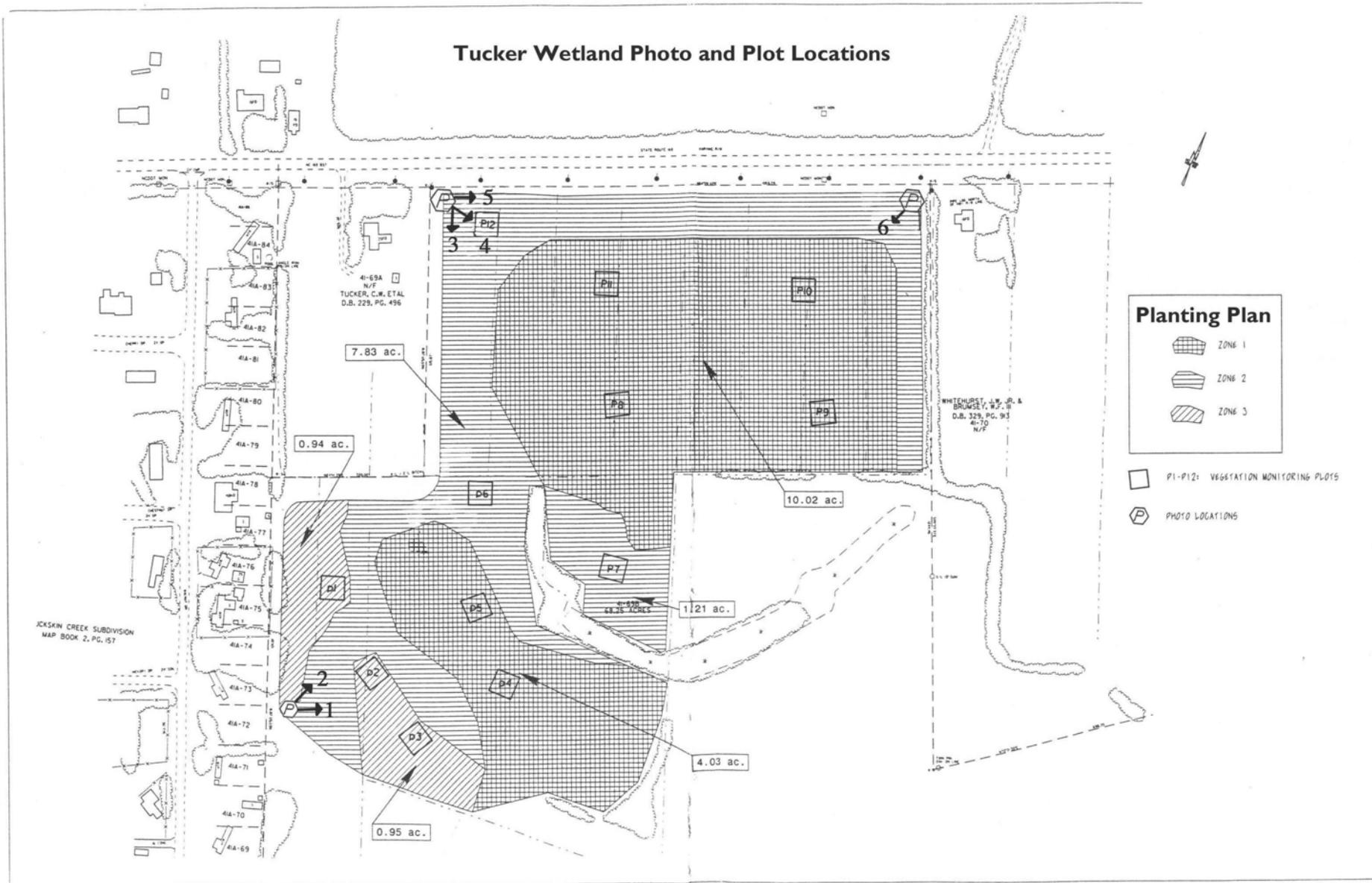
**Site Notes:** Site is well vegetated with various grasses, a variety of *Juncus* sp., and sedges. 4 to 6 inches of standing water noted in a small area of plot 7. Other species noted: volunteer pines, *Scirpus* sp., *Aster* sp., cattails, *Baccharis halimifolia*, foxtail, woolgrass, fennel, pickerel-weed, *Cyperus* sp., pennywort, *Panicum* sp., *Lespedeza* sp., red maple, saw grass, and *Sesbania* sp.

### **3.4 Conclusions**

Of the 48 acres of this site, approximately 25 acres involved tree planting. There were 12 monitoring plots established throughout the planting areas. The 2002 vegetation monitoring of the planted areas revealed an average density of 394 trees per acre, which is above the minimum requirement of 290 trees per acre. All zones remain above the minimum requirement of 290 trees per acre.

NCDOT will continue vegetation monitoring at the Tucker Mitigation Site.

FIGURE 5 – PLOT LOCATIONS AND PHOTO POINTS





#### **4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS**

The results of the fourth year of monitoring indicate this site was successful. All groundwater gauges met the hydrologic success criteria.

Vegetation data also met success criteria. The average plot density was above the required 320 stems/acre showing a rate of 394 stems per acre. Densities within each zone were above the 320 stems per acre as well.

Vegetation and hydrologic monitoring will continue for a fifth year in 2003 at the Tucker Tract Mitigation Site.

**APPENDIX A**

**DEPTH TO GROUNDWATER PLOT**

## APPENDIX B

### SITE PHOTOS

# Tucker Tract



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

